

## VOCAL AND OTHER BEHAVIOUR OF STIERLING'S WOODPECKER

*DENDROPICOS STIERLINGI*

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Stierling's Woodpecker *Dendropicos stierlingi* is one of the least known African woodpeckers, inhabiting parts of southern Tanzania, Malawi, and Mozambique (White 1965, Snow 1978). During and after the Fifth Pan-African Ornithological Congress in Lilongwe, Malawi, in late August 1980 three days were spent studying, and especially recording vocalizations, of Stierling's Woodpeckers in the Dzalanyama Mountains, southwest of Lilongwe. This report, the first to treat this species in any detail, presents the results of these observations and an analysis of vocal data.

Equipment used in the study included binoculars up to  $\times 12$  and a Stellavox SP-7 tape-recorder and Schoeps CMT-42 condenser microphone with a 30-inch (approximately 76 cm) parabolic reflector. Horne performed all the sound recording in addition to observing, while Short observed and played back using a Sony cassette tape-recorder. Audiospectrographic analysis was done using the wide band pass filter of a Kay Elemetrics Sonagraph 6061-B at the American Museum of Natural History. The studies took place on 26, 30 and 31 August 1980 in hilly *Brachystegia* (miombo) woodland at 1200 m in the Dzalanyama Forest Reserve 47 km south-southwest of Lilongwe. The population along 6 km of road through the woodland was estimated as at least five, and probably seven pairs. Altogether at least nine individuals were observed, and recordings were obtained of the voices of three males and two females. For vocal comparisons (Figs. 1,2,3 and Discussion) sonagrams of two other woodpeckers are included: Bearded Woodpeckers *Dendropicos namaguus* from the southern Ewaso Ng'iro River area and the Laikipia region of Kenya, obtained in July and August 1977 and 1978, and of the Cardinal Woodpecker *D. fuscescens* obtained at Karen, Nairobi, in September 1977 and at the Olorgesailie Prehistoric Site south of Nairobi during July 1977.

Nomenclature is that of Morony, Bock & Farrand (1975), Snow (1978) and Short (in press A). Vocalizations are described and interpreted according to the terminology and discussion of Winkler & Short (1978).

## CHARACTERISTICS AND ECOLOGY

Benson & Benson (1977) reported a breeding record for August in Malawi, and according to N. Hunter (pers. comm.) breeding takes place in September-October in the Dzalanyama region. This woodpecker was found to be at least as common during the present study, indeed, once its voice was learned, more common than the Cardinal Woodpecker (four seen). Other picids in the vicinity were Bennett's Woodpecker *Campethera bennettii* (one heard), the Golden-tailed Woodpecker *C. abingoni* (one glimpsed) and the Bearded Woodpecker (none seen, but reported by N. Hunter, pers. comm.).

In late August 1980 Stierling's Woodpeckers were active vocally and in Drumming (see below), and were common, although individuals and pairs were well spaced apart (two pairs observed, the individuals of which were loosely associated, plus at least five apparently single birds). The quavering Rattle Call, rather loud Drumming, and darting flight drew attention to the birds, which can be distinguished immediately from the slightly smaller Cardinal Woodpecker by the plain brown back, white-spotted dark underparts, blackish hind-crown and strong black moustachial mark which continues on to the lower neck. It appears much more manoeuvrable and agile than the Cardinal Wood-

pecker in its fast flight through dense tree cover, bursting through or darting around foliage and disappearing rapidly. Compared with the Cardinal Woodpecker it appears 'dumpy', heavier-bodied, longer-winged, and faster flying; perched, it more resembles a small Bearded than a Cardinal Woodpecker.

Stierling's Woodpeckers were not breeding at the time of these studies, although C.J. Vernon (pers. comm.) had reported one about a cavity in a stub 7 m up a live tree in the study area prior to the authors' arrival, but no roosting or other activity at the hole was found. A female was active briefly about a cavity 6 m up the trunk of a live tree on 30 August, and the hole appeared to be freshly worked. The Drumming and vocalizations reported below do indicate territorial activity, and the loose association and maintenance of contact between members of two pairs suggest that breeding was about to begin. The single series of Weep Calls reported below is also suggestive of the onset of breeding.

Foraging Stierling's Woodpeckers usually move somewhat rapidly over the trunk and branches of trees, almost continuously delivering loud taps (much more frequent than in foraging *D. fuscescens*). The birds can be followed about by the noise of their foraging taps and sounds of their occasional excavating deep into the bark. They forage on the trunk, and major branches of diverse trees, but especially on branches 4-12 cm in diameter. Only occasionally do they feed at the tips of branchlets and bases of twigs (they were never seen hanging upside down from the tip of a twig, as is frequently seen in the Cardinal Woodpecker). They also utilize small trees, foraging up the trunk and branches to the top. Usually they forage at mid and upper levels in the canopy. Although this woodpecker moves frequently, pausing to tap here and there and probe under the bark, it also settles in place to work for up to ten minutes or more at rough places in the bark or broken tips of branches, from which they were seen to extricate insect larvae and an apparent centipede. The few Cardinal Woodpeckers seen in the vicinity foraged more frequently at lower levels in the trees, they worked over smaller trees and shrubs, they fed frequently in twigs and small branchlets, they tapped less often and more weakly, and they excavated into the bark less frequently.

Participation in mixed-species foraging flocks was noted, but Stierling's Woodpeckers seem to associate only loosely with the foraging groups, moving a short distance (perhaps through a part of their territory), then remaining behind or diverging from the flocks. These foraging flocks included the Drongo *Dicrurus adsimilis*, the Spotted Creeper *Salpornis spilonota*, the White-breasted Cuckoo Shrike *Coracina pectoralis*, and various flycatchers, warblers and other species.

When reacting to playback, Stierling's Woodpeckers move frequently, often perching crosswise on branches as they search for the source of the sound, and issuing a challenge in the form of Rattle Calls or Drumming (see below). Visual displays include Crest Raising (in both sexes), especially in Rattle-Calling individuals; the crest is erected and the feathers variably are thrust forward. The only other visual display observed was Wing Flicking, repeated fast spreading of the wings, especially in agitated, playback-responding birds.

Few interactions were noted with other species. A Lesser Honeyguide *Indicator minor* perched near a male Stierling's Woodpecker at one point, then followed it to another perch, but the woodpecker seemed unconcerned and the honeyguide flew off. One actively calling and Drumming male was silenced by the sudden appearance in the same tree of a Golden-tailed Woodpecker; both birds then flew off. Because vocalizations of Stierling's Woodpecker were played back, reactions of Cardinal Woodpeckers to the Stierling's Woodpecker playback were observed: on three occasions involving different Cardinal Woodpeckers, repetitive playback of Stierling's Woodpecker's calls

and Drumming elicited approach by the Cardinal Woodpecker, in a wary, alert manner. These approached to within 10m, and one male very weakly drummed three times as playback continued, suggesting that these two species may interact. In two areas a Cardinal Woodpecker was found in the vicinity of Stierling's Woodpeckers, but the other Cardinal Woodpeckers tended to be in open, woodland-edge situations and secondary growth, whereas Stierling's Woodpeckers consistently were found within tall woodland.

Reactions of the Stierling's Woodpeckers to playback may have elicited some intraspecific interactions; indeed, the strong reactions of males seemed several times to result in withdrawal or moving away of a female. When both sexes were present in proximity to one another it was difficult to distinguish their interactions from their more or less simultaneous reactions (vocalizations) to the playback.

### ACOUSTICAL SIGNALS

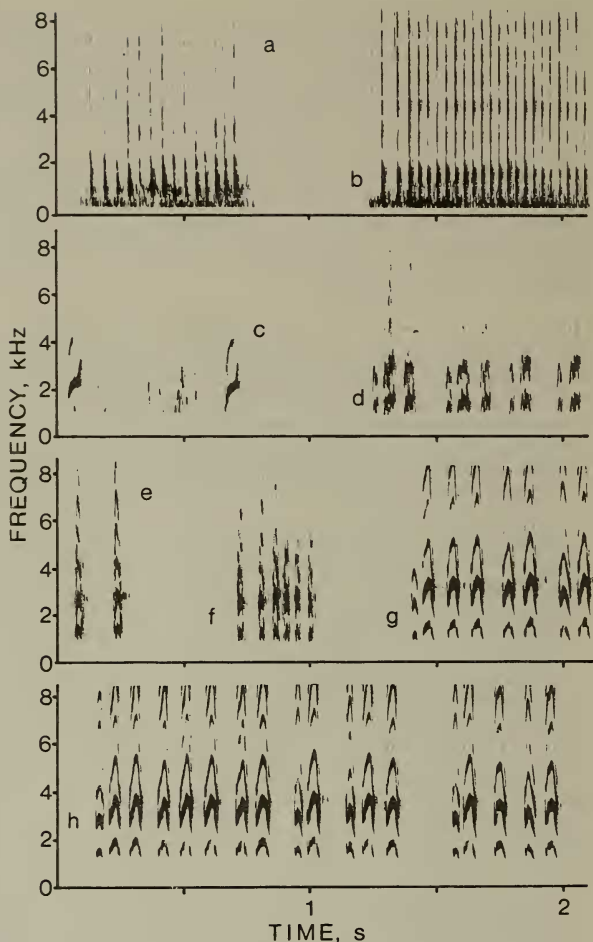
**FLIGHT RUSTLE:** like many woodpeckers (see, for example, Short 1971, 1972; Winkler & Short 1978) Stierling's Woodpecker is able to flutter or rustle its wings when it chooses to do so, as when startled or when interacting with (chasing, supplanting, fleeing from) other conspecific birds. The Rustling sounds were evident particularly during playback-stimulated interactions between a male and a female. Tape-recorded examples are few and sonagrams show too much background noise for illustration here. The Rustling sounds occur at a tempo of 20-22/s.

**SIGNAL TAPPING and DRUMMING:** this is the only African woodpecker known to employ Signal Tapping - single, loud taps on the surface of a tree, usually interspersed with regular Drumming. The latter is a signal given at intervals, and often in response to playback of Rattle Calls or of its Drumming. Over 200 bursts of Drumming by both sexes were heard in three days, most of them stimulated by playback of Rattle Calls and Drumming. Analyses showed there to be two types of Drumming, Slow Drumming (Fig. 1a) at 20-24 beats/s (three examples), and Fast Drumming at an average of 28.5 beats/s (range 25.8 - 30.5). Both types are delivered by the same bird, even in the same sequence of Drumming bursts. Fast Drumming (Fig. 1b) is the commoner form; in 21 examples the duration was 0.43 - 1.19 s (mean 0.727 s) and they contained 11-36 (mean 19.22) beats per burst. Almost all have the first beat well separated from the others, two-thirds are louder near the start than at the end, and some show breaks or weakening at one or several points in a burst. Drums in a series may alternate or vary irregularly in loudness at a single Drumming site. Compared with the Fast Drumming (Fig. 2a,b) of the Cardinal Woodpecker the Fast Drumming of Stierling's Woodpeckers is similar but louder, usually faster, and the bursts are fewer per unit time, i.e. at 5/min in three cases, than in at least some regularly Drumming individuals of the Cardinal Woodpecker (8-9/min). The Cardinal Woodpecker Drums much less frequently than does Stierling's Woodpecker, and its Drums are rarely noted by observers. The Bearded Woodpecker Drums (Fig. 3a) more loudly, its bursts are delivered much more slowly (at 9-14 beats/s), and there is a detectable slow-down as each burst progresses.

When Drumming, the actual taps with the beak seem to hit over a wide area; there is movement of the head such that the bill covers a wide area of bark surface. In response to playback the bird moves upwards in a tree, Drumming at intervals on a branch to its tip, where it may Drum several times. It also often backs down to an apparently better Drumming site, if a higher one proves less suitable. It keeps moving upwards in the tree until near the top on a good resonating branch (e.g. a dead branch), where it may Drum for a period of 3-45 min before departing, to Drum in another tree nearby. Thus, the Drumming varies considerably in loudness and quality, depending upon the

Fig. 1 Acoustical signals (audiospectrograms) of Stierling's Woodpecker *Denropicos stierlingi*. Wide-band sonagrams of sounds tape-recorded in south-western Malawi.

- a) Slow Drum
- b) Drum
- c) Weep
- d) Fast Rattle
- e) Pits
- f) Short Rattle
- g, h) Rattle



resonance of the particular Drumming site, as well as upon the type of Drumming and the force that may be used in this action. It was clear that a Stierling's Woodpecker Drums more frequently in response to playback (of voice or Drums) if in a dead tree or tree with dead limbs, but responds vocally (see below) if it is in a live tree. Drumming, as in other picids, seems to indicate the presence of a territorial woodpecker, and its location, perhaps particularly to its mate. Generally the context is aggressive.

PIK NOTES: single soft *pik* notes, or a series of them, were heard several times, but tape-recorded only once, too weakly to be analyzed fully. The notes are fast, mechanically sounding, sonographically inverted V-shaped, and have a frequency of 2.1kHz, with a strong harmonic tone. The function, motivation and meaning of these notes, in the sense of Winkler & Short (1978), remain to be established.

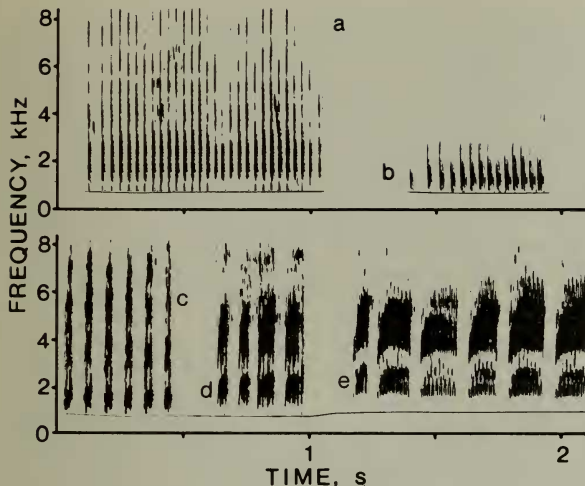


Fig. 2 Acoustical signals (audiospectrograms) of the Cardinal Woodpecker *Denropicos fuscescens*. Wide-band sonagrams of sounds tape-recorded in Kenya.

- a, b) Drums
- c) Rattle-begging of a juvenile male
- d) intermediate juvenile call
- e) Short Rattle

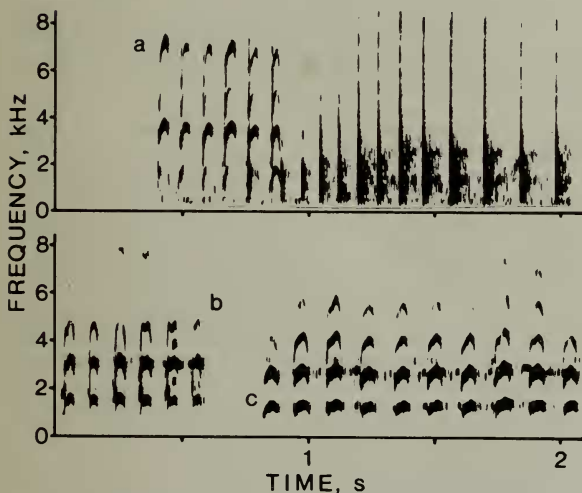


Fig. 3 Acoustical signals (audiospectrograms) of the Bearded Woodpecker *Dendropicos namaquus*. Wide-band sonagrams of sounds tape-recorded in Kenya.

- a) Wikka and Drum
- b, c) Wik Rattles

WEEP CALL: also heard rarely and tape-recorded but once is a weep-sounding note (Fig. 1c), uttered in an irregular series over 7s. Each note is 0.05 - 0.06 s in duration, and rises from 1.5 - 2.5 kHz, then ends sharply in a rise to 3.0 kHz; there is a weak overtone at 2.5 - 4.5 kHz. This vocalization closely resembles Kweek Calls of such species of *Picoides* as *P. nuttallii* and *P. scalaris* of North America (see Winkler & Short 1978, Fig. 22). In *Picoides*, Kweek Calls particularly are prevalent prior to breeding, and mark interactions between the sexes, but the present data are too sparse to

allow postulation on the function of the Stierling's Woodpecker's Weep Call.

**FAST RATTLE CALL:** soft series of repetitive notes composed of Pik-like elements were delivered by a male on 31 August, as part of its reaction to playback of its Rattle Calls (see below). The notes consist of from one to five peaked, connected elements (Fig. 1d) and sound like *bdddt* when close enough to the bird to hear them. The frequency of the peak is at 2.0 kHz, with a strong first harmonic tone in the three series (total of 24 notes) available for analysis. Single notes may be as short as 0.02 s, and compound notes with five elements are 0.1 s in duration. Their context suggests an aggressive motivation (*sensu* Winkler & Short 1978: 92), as the calling male was singularly 'tame' and strongly reacted to playback as if seeking the 'calling' (playback) bird. This is one of the two calls of this woodpecker which shows any similarity to the main call (Short Rattle Call) of the Cardinal Woodpecker (Fig. 2e; and see Discussion).

**PIT RATTLE NOTES:** commonly heard from both sexes in reaction to playback were sharp *pit* calls, usually in loose series, and identical to notes of Short Rattle Calls (see below). These are 0.02 - 0.04 s in duration and sonographically (Fig. 1e) appear peaked in structure with strong overtones and initial and terminal vertical elements which connect the various tones. The fundamental tone is at about 1.5 kHz but the first harmonic tone at 3.0 kHz usually is dominant (in 15 of 19 analyzed) or else is codominant with the fundamental tone. As many as five overtones can be distinguished, and the elements connecting these provide sound at all frequencies at least up to 8 kHz. Functionally these notes are of the 'I am here', 'go away' type; motivationally they show arousal and aggression; and their likely meaning is to indicate the location and motivation (aroused, aggressive woodpecker) of the calling bird (see Winkler & Short 1978: 85-86, 92, 94).

**SHORT RATTLE CALL:** another quite frequent vocalization is this call, a series of four to seven Pit Notes lasting 0.23 - 0.47 s. All eight calls analyzed show a gap between the first and second notes, thus a lead note is followed by a rapid series of three to six notes (Fig. 1f). As can be seen in that figure, the individual notes are structurally identical to Pit Calls described above. In fact, the Short Rattle Calls occur mainly in series of calls interspersed with Pit Calls, suggesting similarities in function, motivation and meaning of these calls. Basically, Short Rattle Calls were associated with apparent searching behaviour, the bird appearing to seek the calling (playback) intruder, and they seem to reflect greater aggression than do the associated Pit Calls. The Short Rattle Call differs strikingly from that of the Cardinal Woodpecker (Fig. 2e; see Discussion).

**RATTLE CALL:** the commonest vocalization appears to be the Rattle Call, which is the loudest, most far-carrying of the Stierling's Woodpecker's array of calls, and that most likely to call the attention of the human observer to it. Rattle Calls are uttered in flight (often when flying towards the playback sound) or while the bird is perched. Analysis of nine complete and two incomplete Rattle Calls (Fig. 1g, h) shows this vocalization to consist of a series of usually asymmetrically peaked notes with strong overtones delivered in 0.4 - 2.53 s. Its duration is difficult to determine at times because of the major feature of this Rattle Call; the call starts with a short, low-pitched, soft pik-like note associated closely with a following, longer, louder and higher-pitched note, and there is a strong tendency for the calls to split into parts by interspersing of such shorter notes and an associated note in each case. Overall the calls have a wavering quality and sound as if there were double or triple notes within the Rattle Call. Since the calls are

often uttered in sequence it sometimes is difficult to separate one Rattle Call from another. Very long calls have these numbers of notes: a) one of 2.52 s has five short notes and 22 long notes (thus five subsections); b) another of 1.87 s has two short and 18 long notes; c) a third, of 1.83 s (Fig. 1h) has four short and 14 long notes.

The peaked short notes of the Rattle Call are 0.015 - 0.03 s in duration, and are separated by 0.01 - 0.02 s from the following associated long note (long notes are 0.04 - 0.07 s or more apart in series). The fundamental tone of short notes is 1.3 - 1.4 kHz for lead notes of a Rattle Call, but short notes of subsections are pitched higher, at 1.4 - 1.55 kHz. As in the long notes, the first harmonic (3.0 kHz) is dominant. Because the note is softer, fewer overtones are usually evident (up to 5 or 6) than in long notes. The latter notes vary, especially when paired, in which case the first note of a pair is lower pitched and shorter, tending thus towards the short notes just described. The fundamental tone of long notes varies between 1.5 and 2.0 kHz, but is often weak; at best it is codominant with the first harmonic tone at 3.0 - 3.8 kHz, but often higher overtones are louder than the fundamental tone. At least five overtones occur up to 8 kHz (and continuing above that), contributing to the ringing quality of the call. The long notes are 0.05 - 0.07 s in duration. Essentially unpaired long notes (several 0.5 - 0.6 s sequences) have a tempo of 11 notes/s; the dual nature of the notes of Rattle Calls and their subsectioning tendency makes it difficult to estimate an average tempo for all notes of the call, but 11/s is approximately that for most longer calls. All long notes show asymmetry, as mentioned, tending usually to rise slowly and drop off more sharply, the peak being skewed towards the end of the note. Sometimes there is a break in the rising section, tending to form a sub-peak. The short notes are more symmetrical than are long notes and they and initial long notes of couplets may even peak in the first half of the note (Fig. 1h), the reverse of the usual condition in long notes.

The Rattle Call is uttered sporadically as a foraging Stierling's Woodpecker moves about its presumed territory. Playback may initially cause it to approach silently, then perhaps to Drum, but repeated playback, and sometimes initial playback, brings in the woodpecker giving Rattle Calls in flight, as if in challenge. It was noted that males more often give Rattle Calls, whereas females more frequently utter Fast Rattle, Pit, and Short Rattle calls in response to playback. It is suggested that the Rattle Call of this species is its chief long-distance call, indicating location and presence of an aroused, aggressive territorial Stierling's Woodpecker. Its function, meaning and motivation (Winkler & Short 1978) are more nearly similar to the commonly heard Rattle Call (Fig. 3b, c) and to the Wikka Call (Fig. 3a) of the Bearded Woodpecker than to the Short Rattle Call, the chief distance vocalization of the Cardinal Woodpecker (see Discussion).

#### DISCUSSION

The abundance of Stierling's Woodpecker over its range is unknown; that is, the paucity of specimens, observations and localities of occurrence of this species suggest that it may be patchily distributed and perhaps rare in much of its range. Its range in southernmost Tanzania and in northern Mozambique remains relatively little known, and it could prove to be locally common other than in the Dzalanyama Mountains, although it is surprising that there have been so few records of it (Benson & Benson 1977) from ornithologically well known Malawi. Factors affecting its distribution remain to be determined, and could prove essential for the preservation of the species if it is indeed rare in most of its range. Benson & Benson (1977: 116) suggested that competition by the Cardinal Woodpecker could be adversely affecting Stierling's

Woodpecker. There is evidence that these two species interact, and it may be that the Cardinal Woodpecker restricts the distribution or numbers of Stierling's Woodpeckers in some areas. However, in the area of the present studies Stierling's Woodpeckers appear at least to hold their own in mature hilly *Brachystegia* woodland. Undoubtedly the Cardinal Woodpecker is favoured, and indeed the Stierling's Woodpecker may be eliminated by human activities which open these woodlands or reduce them to secondary vegetation.

Stierling's Woodpecker appears relatively distinctive behaviourally, yet the vocal and other data presented here support the view (Short *in* Snow 1978, Short *in* press A, B) that this species taxonomically connects the Cardinal Woodpecker subgroup (*Dendropicos sensu stricto*) with the Bearded Woodpecker subgroup ('*Thripias*', '*Mesopicos*' in part, i.e. *Dendropicos namaquus*, *D. xantholophus* and *D. pyrrhogaster*) of *Dendropicos*. The Drumming of Stierling's Woodpecker closely resembles that of the Cardinal Woodpecker (compare Fig. 1b and 2a, b), even to having several forms of this signal (Slow Drumming and Drumming, tempi similar in both species). The Drumming of Stierling's Woodpecker is generally louder, it is rendered more frequently and probably in a different context, and it therefore may have a different meaning, motivation or function (*sensu* Winkler & Short 1978) from that of the Cardinal Woodpecker. However, the similarity of their Drumming affords a possibility of their Drumming serving as interspecific communication, perhaps in territorial exclusion, although that requires demonstration.

The common vocalizations of Stierling's Woodpecker are the Fast Rattle Call (Fig. 1d), the Short Rattle Call (Fig. 1f) and the Rattle Call (Fig. 1g, h). These differ markedly from the Short Rattle Call (Fig. 2e) of the Cardinal Woodpecker and more closely resemble the Wik Rattle Call (Fig. 3c) of the Bearded Woodpecker. In Fig. 2, however, there is depicted a rattle-begging call (Fig. 2c) of a juvenile male Cardinal Woodpecker, attended by an adult female at Karen, Nairobi, and a call (Fig. 2d) of the same juvenile which is intermediate between the juvenile rattle-begging call and the adult Short Rattle Call series (Fig. 2e). The close resemblance of the Cardinal Woodpecker's juvenile rattle-begging call to the Short Rattle Call of Stierling's Woodpecker (Fig. 1f) is remarkable, and the ontogenetic connexion of that form of call to the apparently (and in its sound to the human ear, actually) very different adult Cardinal Woodpecker Short Rattle Call provided by the intermediate Call (Fig. 2d) indicates that the adult Short Rattle Calls of the two species basically share a similar derivation, despite their structural differences.

The Rattle Call of Stierling's Woodpecker (Fig. 1g, h), compared with the Wik Rattle Call of the Bearded Woodpecker (Fig. 3c, and variant such call, Fig. 3b), both from the southern Ewaso Ng'iro River area, Kenya, show great structural similarity, although the latter species lacks the effect of grouping or pairing of notes and shorter initial notes which characterize the Rattle Call of Stierling's Woodpecker. A Wikka Call of the Bearded Woodpecker (Fig. 3a, from the Laikipia area of central Kenya) given during an interaction between an adult male and adult female (the Drumming in Fig. 3a follows immediately after the Wikka Call, as shown), also resembles the Rattle Call of Stierling's Woodpecker, but less closely than does the Bearded's Wik Rattle Call.

Other intraspecific calls of the Bearded Woodpecker and of the Cardinal Woodpecker also bear similarities to various calls of Stierling's Woodpecker (e.g. Kweek Calls, Mutter Calls, Short & Horne *in* prep.; see also Winkler & Short 1978), but the examples just discussed suffice to demonstrate the general similarities as well as some differences among the three species. In appearance, posture and demeanour Stierling's Woodpecker is more like a small

version of the Bearded Woodpecker than like the Cardinal. Although it is not the purpose of this report to treat the relationships of these woodpeckers in detail, it should be emphasized that behaviourally Stierling's Woodpecker shows approaches to both the Cardinal Woodpecker and Bearded Woodpecker groups, and that these taxa appear from behavioural evidence to be phylogenetically closely related congeners.

On a broader level, too little is known of the vocalizations of African woodpeckers to place the vocal repertoire of Stierling's Woodpecker fully in perspective, but comparison with the acoustical signals of the widely distributed large genus *Picoides* (one African species, *P. obsoletus*, placed along with Stierling's Woodpecker in '*Ipophilus*' by Mackworth-Praed & Grant 1957) shows its repertoire to be generally similar, including Tapping, Drumming, wing-movement signals, and both Short Rattles and Rattle Calls (Winkler & Short 1978). Short (1971, in press B) considers *Picoides* to have been derived from *Dendropicos*, and a detailed comparison of the acoustical repertoires of both genera would be very rewarding from a behavioural as well as from an evolutionary point of view, as shown above by the vocal comparison of juvenile and adult Cardinal Woodpecker and Stierling's Woodpecker Short Rattle Calls. However, the analysis of vocal data on *Dendropicos* has barely begun, and does not permit more than speculative comments. It is hoped that this report will stimulate the generation of further such data on other East African picids, additional to the authors' continuing studies

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#### REFERENCES

- BENSON, C.W. & BENSON, F.M. 1977. *The birds of Malaŵi*. Limbe: Montfort Press.
- MORONY, J.J., Jr., BOCK, W.J. & FARRAND, J., Jr. 1975. *Reference list of birds of the world*. New York: American Museum of Natural History.
- SHORT, L.L. 1971. Systematics and behavior of some North American woodpeckers, genus *Picoides*. *Bulletin of the American Museum of Natural History* 145: 1-118.
- 1972. Systematics and behavior of South American flickers (Aves, *Colaptes*). *ibidem* 149: 1-110.
- in press A. *Woodpeckers of the world*. Greenville: Delaware Museum of Natural History.
- in press B. Speciation in African woodpeckers. *Ostrich*.
- WHITE, C.M.N. 1965. *A revised check list of African Non-Passerine birds*. Lusaka: Government Printer.
- WINKLER, H. & SHORT, L.L. 1978. A comparative analysis of acoustical signals in pied woodpeckers (Aves, *Picoides*). *Bulletin of the American Museum of Natural History* 160: 1-109.

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